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Profile of Allergic Rhinitis Based on Nasal Eosinophil Count, Total Nasal Symptoms Score and Peak Nasal Inspiratory Flow

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Abstract

Allergic rhinitis (AR) is a symptomatic disorder of the nose induced after allergen exposure by an immunoglobulin E (IgE)-mediated inflammation of the membranes lining the nose. The manifestation of AR can affect patients' quality of life. The objective of this study was to evaluate the profile of allergic rhinitis patients in term of nasal eosinophil count, total nasal symptom score (TNSS) and peak nasal inspiratory flow (PNIF). Fourteen allergic rhinitis patients were evaluated using the nasal eosinophil count with Wright-Giemsa staining, total nasal symptom score, and PNIF. The study comprised of 6 (42.9%) men, and 8 (57.1%) women with a mean of age 21.15±3.78 years. Participants' symptoms and characteristics included sneezing (42%), nasal blockage (21.4%), itchy nose (21.4%), and rinorrhea (14.3%) with a mean TNSS of 8.2±1.8. Intermittent AR was found in 14.3% subjects, persistent AR 78.6%, mild AR 21.4%, and moderate-severe AR 78.6%. The mean PNIF was 80±27.46 L/min, and mean eosinophil count of 2.5±1.74. In conclusion, allergic rhinitis patients demonstrated positive nasal eosinophil count with Wright-Giemsa staining, with the majority of them having persistent and moderate-severe RA. They also had nasal airflow impairment, which could affect quality of life.

Keywords: allergic rhinitis, eosinophil, nasal airflow, quality of life.

Profil Rinitis Alergika Berdasarkan Hitung Eosinofil, Total *Nasal Symptoms Score* dan *Peak Nasal Inspiratory Flow*

Abstrak

Rhinitas alergika (RA) merupakan kelainan pada hidung yang diinduksi oleh pajanan alergen yang berhubungan dengan reaksi inflamasi yang diperantarai IgE pada mokusa hidung. Manifestasi RA dapat mempengaruhi kualitas hidup pasien. Tujuan penelitian ini adalah simptomatik evaluasi profil pasien RA dari segi hitung eosinofil nasal, skor total sindrom nasal (TNSS) dan aliran inspirasi nasal (PNIF). Empat belas pasien RA dievaluasi jumlah eosinofil nasal dengan pewarnaan Wright-Giemsa, skor total simtom nasal dan PNIF. Terdapat 6 (42,9%) laki –laki dan 8 (57,1%) perempuan dengan umur rata-rata usia 21,15±3.78 tahun. Simtom dan karakteristik pasien yaitu bersin (42%), sumbatan hidung (21,4%), hidung gatal (21,4%) dan rinorea (14,3%), dengan rata-rata TNSS 8.2±1.8. Rinitas alergika intermiten ditemukan pada 14,3% subyek, yang persisten 78,6%, sedang 21,4% serta sedang-berat 78,6%. Rata-rata PNIF 80±27.46 L/menit, serta rata-rata jumlah eosinofil 2.5±1.74. Dapat disimpulkan pasien RA menunjukkan jumlah eosinofil nasal positif dengan pewarnaan Wright- Giemsa dan kebanyakan memiliki RA yang persisten dengan tingkat sedang-berat. Terdapat juga gangguan aliran udara hidung yang mungkin mempengaruhi kualitas hidup mereka.

Kata Kunci: rinitis alergika, eosinofil, aliran udara hidung, kualitas hidung

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Introduction

Allergic rhinitis is a symptomatic disorder of the nose induced after allergen exposure by an immunoglobulin E (IgE)-mediated inflammation of the membranes lining the nose.[1,2] The symptoms of nasal reactions occurring in allergies are sneezing, nasal obstruction, mucous discharge (rhinorrhea) and /or itching of the nose.[2] These symptoms occur during two or more consecutive days for more than 1 hour on most days.[3]

The prevalence of allergic disease in the United States (US) is 20%, and is still increasing.[4] A survey published in 2006 recorded that 54.6% of individuals in the US test positively for at least 1 allergen.[5] The prevalence of AR in the Asia-Pacific countries such as Australia, China, Hong Kong, Malaysia, Philippines, Taiwan and Vietnam, ranges on average from 4.2-13.2%.[6] Allergic rhinitis is rarely found in people under the age of 5 years old, and it peaks between the ages of 17 and 22 years old.[5] With regard to the relationship between gender and AR, cases are found in women more often than man.[7, 8]

Allergic rhinitis develops from environmental, immunologic and genetic factors.[9] Environmental factors include aeroallergens, such as mites and cockroaches, and are significantly related to the persistence of RA. The degree of AR is significantly related the allergen concentration in the environment.[10] Indonesia is a country without a spring season, which can lead to lighter symptoms because of the allergen exposure and low concentration over a period of years (perennial).[11] Other environment factors such as temperature, humidity, pollution and lifestyle, significantly influence the manifestation of AR. The immunologic factor is related to the role of Th1 and Th2. The latest concept of allergic disease is the role of regulatory T cells (Treg), and the atopic diseases are caused by a deficiency of Treg. The Treg play an important role in the regulation of Th1 and Th2.[12] Genetic factors such as the atopic history of the family, is the strongest factor in the development of allergic symptoms.[13]

Allergic rhinitis is not a dangerous disease, but the symptoms can affect patient's quality of life.[14] The cost of this disease can make an impact on a nation's economy, and half of the cost is used for prescription medication.[1] A decrease in productivity and missed work can cause economic problems, and AR can impact, health insurance due to exacerbations and complications of allergic disease.[15]

Allergic rhinitis can be diagnosed by anamnesis, physical examination and additional examination by using allergic tests, whether it is in vivo or in vitro, but on allergic tests, that many more people have positive result than have AR.[1] Patients with nasal symptoms who had a family atopic history can have a stronger AR diagnosis. Nasal eosinophil count can be used as an additional examination in the health facilities that have limited skin prick tests.[16] The degree of AR symptoms can be measured by using a scoring system of symptom that is easily understood by the patient, which will be related to daily activity. The total nasal symptoms score (TNSS) is the overall symptom score of AR, and is often used to evaluate the AR treatment.[17,18] Higher values on the TNSS show more severe AR symptoms. Allergic rhinitis manifestation based on the duration of the symptoms can be classified as intermittent and persistent. The degree of severity can be classified as mild, if there are no problems in daily activity, and moderate-severe if there are problems in daily activity.[2] Nasal airflow and patency can be objectively examined by using peak nasal inspiratory flow (PNIF).[19] Low value for PNIF shows that there is reduced nasal airflow and patency.

The aim of this study was to determine the profile of allergic rhinitis patients in terms of nasal eosinophil count, total nasal symptom score and peak nasal inspiratory flow.

Material and Methods

Patients

Fourteen patents with allergic rhinitis symptoms, six men and eight women had a detailed clinical history and a complete physical examination. The diagnosis of persistent, intermittent, mild and moderate-severe allergic rhinitis was made according to ARIA guidelines and on the basis of one's history of allergy to house dust.

Study Design

This research was a cross-sectional study of patients aged 15-55 years old diagnosed with AR based on ARIA-WHO 2008 criteria who came to the Ear Nose and Throat Department at Rumah Sakit Umum UKI, Jakarta in 2016. The participants were recruited with consecutive sampling technique. All patients were asked for their informed consent to be participants in this study. Patients with acute and chronic upper respiratory infections within 30 days before the study, anatomic nasal disorders (i.e., septum deviation), nasal polyps, nasal or oral corticosteroids within the previous 4 weeks, and use antihistamines within the previous week were excluded from the study.

Symptom assessment, nasal eosinophil count and peak nasal inspiratory flow were performed in all patients. This study obtained ethical approval from Rumah Sakit Umum UKI Jakarta.

Nasal Symptoms

The following symptoms were assessed with clinical interview: nasal obstruction, sneezing, rhinorrhea, and itchy nose. Each symptom was evaluated on the following scale: 0 = absent, 1 = mild (symptom was present but was not annoying or troublesome), 2 = moderate (symptom was frequently troublesome but did not interfere with either normal daily activity or sleep), and 3 = severe (symptom was sufficiently troublesome to have interfered with normal daily activity or sleep). Total nasal symptom score was the sum of each individual symptom and was considered as described in previous reports.[20]

Nasal Eosinophil Count

The nasal eosinophil count was determined by scraping the head of the inferior turbinate with a cytobrush (usually used for cervix cytology examination, made in Indonesia with Swedish license), rotating it three times, creating a smear with the Wright-Giemsa stain and analyzed by optic microscope (Olympus CX21LED, Olympus Corporation, Tokyo, Japan). The number of eosinophils was expressed as a mean of 10 optical fields at a magnification of 100.

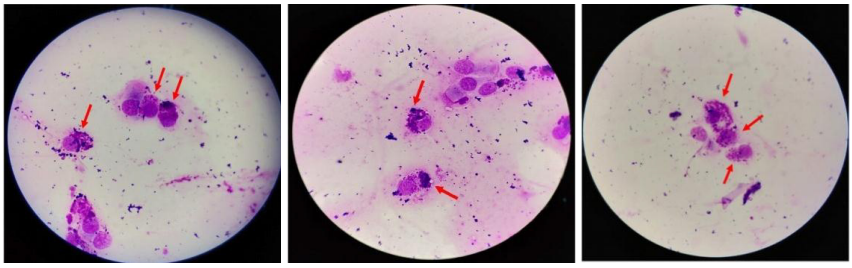

Figure 1. Displays three images showing nasal mucosal eosinophils (red arrows) in Wright-Giemsa staining.

Peak Nasal Inspiratory Flow

Nasal airflow and patency were measured by peak nasal inspiratory flow with In-Check Nasal, Clement Clarke International Limited, as described in previous reports,[20] in the following way: . Hold the In-Check horizontally, and ensure the face mask forms an air tight seal around the nose. The patients were asked to exhale fully, close their mouth, and inhale forcefully through their noses (sniff). The examination was repeated to obtain three readings, with the highest reading recorded in the patient's notes, (L/Min).

Figure 2. Peak Nasal Inspiration Flow (PNIF).

Statistical Analysis

The research data were collected, tabulated and processed. The data then were analyzed descriptively in term of percentages, means and standard deviations (SDs), and the data presented in tables.

Results

Fourteen patients with AR, 6 (42%) men and 8 (57.1%) women with a mean of age 21.15±3.78 years were included in the study and had the following nasal symptoms; sneezing (42%), itching (21.4%), nasal blockage (21.4%) and rhinorrhea (14.3%), with a mean TNSS of 8.2±1.8 (Table 1). Intermittent AR was found in 14.3% patients, persistent AR 78.6%, mild AR 21.4%, and moderate-severe AR 78.6%. The mean PNIF was 80±27.46 L/Min, while the mean nasal eosinophil count was 2.5±1.74 cells.

Discussion

This study examined patients with AR with a mean of age 21 years old. Similarly, other study showed the peak incidence of AR occurred between 17 to 22 years of age.[5] The number of AR cases among women was higher then men. Other studies also found significant differences between men and women, such that AR was found more often in women than in men.[8, 21]

The common clinical symptoms of AR are itchy nose followed by recurrent sneezing, rhinorrhea and nasal blockage.[2] In the other cases, these symptom were followed by itchy eyes, itchy ear, and itchy palatum molle. In this study, sneezing was the most common symptom, which is consistent with other study where 90% of the participants complaining of severe sneezing.[22]

The mean TNSS in this study was 7.92±1.9, which is comparable to other study that found the TNSS in patients with AR was 7.1±2 and without AR 1.9±1.[23] A mean TNSS of 7.9 shows that the AR symptoms were severe. This study found that most cases of AR, based on the time period of symptoms, were persistent AR. The persistence of AR correlates significantly with the presence of aeroallergens, such as mites and cockroaches.[24] This study also

Table 1.The Characteristics of Allergic Rhinitis Patients

Variable	(%) / Mean (Standard Deviation) n:14
Sex	
Men	6 (42.9%)
Women	8 (57.1%)
Age in years	21.15±3.78 (min=15, max=31)
Symptom of AR	
Itching	3 (21.4%)
Sneezing	6 (42.9%)
Rhinorrhea	2 (14.3%)
Nasal blockage	3 (21.4%)
Total nasal symptom score	7.92±1.9 (min=4, max=12)
Duration of symptom	
Intermittent	2 (14.3%)
Persistent	12 (85.7%)
Degree of severity	
Mild	3 (21.4%)
Moderate-severe	11(78.6%)
Nasal eosinophil count	2.5±1.74 cells (min=0.9, max=6.9)
Peak nasal inspiratory flow	80.77±26.91 L/Min (min=45, max=130)

found that most of AR, based on the degree of severity, were moderate-severe, occurring in 78.6% of the sample. The severity of AR correlated with the allergen concentration in the environment.[10]

The mean PNIF in this study was 80 L/Min was lower than normal (120 L/Min).[25] The low value for PNIF indicates the presence of barriers to air flow in the nose. Airway blockage of the nose can effect the quality of life. The nasal blockage is mostly caused by the obstruction of nasal mucous and is rarely caused by fluid (rhinore). Histamines are not the main factors that cause blockages in the nose; rather, nasal blockages are usually caused by other factors, such as cysleukotriene (cysLT1) and thromboxane A_2 (TXA_2). Processes involved in nasal blockage include the loss of sympathetic tonus caused by nervous irritation in the mucous of the nose, vasodilatation of the blood vessels in the nose, and contraction of the vena cushion and venule compression because of the dilated artery in the intraosseous canal from periosteal cavity.[26]

Conclusion

Allergic rhinitis patients had an increased nasal eosinophil count. The most frequent AR cases were persistent and moderate-severe based on the total nasal symptom score. Additionally, there was nasal airflow impairment, which could affect quality of life.

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